INTERPLANETARY SHOCK TRIGGERING OF AURORAL SUBSTORM ACTIVITY: A MECHANISM

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We use 1997-1998 WIND solar wind data and POLAR UV imaging data to study magnetospheric responses and substorm triggering mechanisms during and after interplanetary (IP) shock events. The nightside auroral responses are classified into three types: substorm expansion phase (SS) (or substorm further intensification) events, pseudobreakup (PB) events, and quiescent (QE) events. It is found that the solar wind precondition determines the causes of the different auroral responses, with a ~ 1.5 hr "precondition" (upstream of the IP shock) giving the best empirical results. The upstream IMF B_z is strongly southward prior to substorm triggerings (44% of all events), the IMF B_z is ~ 0 nT for PB triggerings (39% of all events), and the IMF is almost purely northward for quiescent events (17%). A magnetotail-compression substorm triggering model is developed and presented. This model uses dayside magnetic reconnection to load the near-Earth plasma sheet and a current disruption mechanism to unload the stored energy. We call this model a Dripping, Tilting Bucket (DTB) model.

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